

REMARKS

The foregoing amendment adds independent claim 19 to the application. The amendment also amends the abstract and amends Figures 5 and 6 to include a ---Prior Art--- designation. Pending in the application are claims 1-19, of which claims 1, 7, 13, 16 and 19 are independent. Claims 1-6 and 13-18 have been withdrawn pursuant to a Restriction Requirement. The following comments address all stated grounds for rejection and place the presently pending claims under consideration in condition for allowance.

New independent claim 19 corresponds to the subject matter of original claim 7 and further recites that the crosslinked polymer membrane is produced in a chemical reaction between a crosslinkable polymer deposited onto a surface of the matrix and a crosslinking agent, as described in the specification at least, for example on page 21, line 4 through page 24, line 4. *No new matter is added.*

Objections to the Drawings

Regarding the objection to the drawings, Applicant has amended Figures 5 and 6 to include a ---Prior Art--- designation, as requested by the Examiner.

Objections to the Specification

Regarding the objection to the abstract, Applicant submits herewith a replacement abstract, which complies with the requirements cited by the Examiner. Specifically, the replacement abstract is concise, consisting of 129 words, and avoids use of legal phraseology, such as "means" and "said".

35 U.S.C. 103(a) Rejections

Applicant traverses the rejection of claim claims 7, 8, 10, and 11 under 35 U.S.C. 103(a) over Suzuki (U.S. Patent No. 5,346,780) in view of Savinell *et al.* (U.S. Patent No. 5,525,436) and submits that claims 7-12 are patentable over the cited references. The cited references, alone or in combination, do not teach or suggest a fuel cell including a protective membrane-equipped composite electrolyte having a surface coated with a *crosslinked polymer membrane*, as recited in independent claim 7.

The Suzuki reference describes a fuel cell including an electrolyte layer held by a pair of gas-diffusion layers. The Suzuki reference does not teach or suggest the claimed protective membrane-equipped composite electrolyte, because Suzuki does not teach or suggest that the electrolyte layer can include a surface coated with a crosslinked polymer membrane, as recited in claim 7. In fact, the Suzuki reference does not teach or suggest including any sort of coating on a surface of the electrolyte layer.

The Savinell reference does not compensate for the deficiencies of the Suzuki reference. The Savinell reference describes a solid polymer electrolyte membrane. The Savinell *et al.* reference describes that polymers used to form the membrane that “demonstrate solubility in dilute acid may be made stable by crosslinking in place in the film by any of a number of known crosslinking techniques, including free radical crosslinking (see column 5, lines 45 through 50)”. According to the Examiner, it would therefore be obvious to modify the electrolyte layer of Suzuki to include a coating comprising a crosslinked polymer membrane.

Applicant respectfully disagrees. The Savinell reference does not teach or suggest crosslinking in a film used as a *coating membrane*, as recited in claim 7. For example, the protective membrane-equipped composite electrolyte in the fuel cell of claim 7 includes a coating membrane (i.e., a surface coated with a crosslinked polymer membrane), which coats the electrolyte to prevent the *leakage* and *elution* of liquid electrolyte from the matrix. In contrast, the Savinell reference describes crosslinking in a film to stabilize the solubility of the polymer forming the film in dilute acid. However, the Savinell reference does not teach or suggest using a crosslinked film to form a coating that coats a surface of an electrolyte. In fact, Savinell *et al.* does not disclose any coating functions.

According to the Examiner, because the coating membrane in the claimed electrolyte can be formed by crosslinking a *surface* of the matrix, the crosslinking of any polymer anticipates this feature. Applicant respectfully disagrees. As described above, Savinell does not teach or suggest forming a *coating* on an outside *surface* of an electrolyte to prevent leakage by merely suggesting that a polymer can be crosslinked to improve stability.

In addition, in the electrolyte of the fuel cell of the present invention, the entire surface of the matrix is typically coated with a crosslinked polymer membrane to provide the coating function to prevent leakage. In contrast, according to the disclosure of Savinell *et al.*,

the crosslinking is present partially (in place) in the film. In this respect, the present invention is different from the technique of Savinell *et al.*

Therefore, even in combination, the references fail to anticipate, never mind obviate, the present claims. None of the references teaches or suggests a fuel cell including an electrolyte having a surface *coated with* a crosslinked polymer membrane.

Furthermore, Applicant submits that there is no motivation to modify the teachings of the Suzuki reference using the teachings of the Savinell reference to reach the conclusion that claims 7-12 are obvious. Such motivation is required under U.S. law for an Examiner to establish obviousness by combining or modifying the teachings of the prior art to produce the claimed invention.

In determining whether a case of *prima facie* obviousness ("obvious on its face") exists, it is necessary to ascertain whether the prior art teachings would appear to be sufficient to one of ordinary skill in the art to suggest making the claimed substitution or other modification. The prior art must provide the motivation to make a change to its own teachings to arrive at the invention under rejection. That is, it is not sufficient that the prior *could be* so modified; instead the prior art must teach or suggest that the prior art *should be* so modified.

The Suzuki reference is not concerned with preventing leakage of liquid electrolyte in a fuel cell. Rather, the Suzuki reference is primarily concerned with improving the performance of a *cathode electrode* in a fuel cell, not an electrolyte. The Suzuki reference also does not teach or suggest any advantage, benefit or motivation for including *any type* of coating on the electrolyte layer, much less a protective membrane coating to prevent leakage. Furthermore, as described above, the Savinell reference does not teach or suggest that the polymer described therein can be used to coat a surface, much less a surface of an electrolyte. Therefore, there would be no motivation to one of ordinary skill in the art to modify the electrolyte in the fuel cell of Suzuki to include the polymer described in Savinell. There is also no motivation to modify the electrolyte in Suzuki to include a coating of any type, particularly a coating formed of a crosslinked polymer membrane.

Under U.S. law, even if a combination of the references teaches every element of the claimed invention, without a motivation to combine, a rejection based on a prima facie case of obvious is improper. The Examiner has not provided an objective reason to combine the teachings of the references to support his statement that it would have been obvious to combine the Suzuki reference with the Savinell reference. As is evident from a close reading of the references and a comparison to the pending claims, the instant rejection of claims 7-12 constitutes nothing more than a picking and choosing of the various elements of the claims from a number of references based, not on motivation from the references themselves, but rather based on the teachings of the application. Thus, the instant rejection constitutes an impermissible hindsight reconstruction of the invention.

Regarding the rejection of claims 9 and 12 under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Savinell and further in view of the WO 00/44816 publication, because independent claim 7, from which claims 9 and 12 ultimately depend, is patentable over the Suzuki and Savinell references, dependent claims 9 and 12 are also patentable. Furthermore, the WO/00/44816 publication also does not teach or suggest an electrolyte having a surface *coated with* a crosslinked polymer membrane.

At least for these reasons, claims 7-12 distinguish patentably over the cited references and the Examiner's rejection under 35 U.S.C. 103(a) should be reconsidered and withdrawn.

New claim

New claim 19 also defines patentably over the cited references. As described above, the cited references do not teach or suggest an electrolyte including a surface coated with a crosslinked polymer membrane. Claim 19 further recites that the crosslinked polymer membrane is produced in a chemical reaction between a crosslinkable polymer deposited onto a surface of the liquid electrolyte-impregnated matrix and a crosslinking agent, a feature neither taught nor suggested in the cited references. As described above, the Savinell reference describes crosslinking a polymer to improve the polymers stability and decrease the solubility of the polymer in dilute acid. However, the Savinell reference does not teach or suggest forming a coating on a matrix surface by depositing a crosslinkable polymer onto the matrix, followed by a reaction between crosslinkable polymer and a crosslinking agent to create a coating formed of a crosslinked polymer membrane.

CONCLUSION


In view of the above, pending claims 7-12 and 19 in this application are believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to reconsider and withdraw the rejection of claims 7-12 under 35 U.S.C. 103(a) and pass this application to issue.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 12-0080, under Order No. CSC-029 from which the undersigned is authorized to draw.

If the Examiner considers that obstacles to allowance of these claims persist, we invite a telephone call to Applicant's representative at (617) 227-7400.

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Respectfully submitted,

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Attachments